# MAGNETIC POSITION DETECTION APPARATUS FOR MICRO MACHINED OPTICAL ELEMENT

## CROSS REFERENCE TO RELATED APPLICAITON

This application is a division of and claims priority from United States Patent Application Serial No. 09/851587, by Murali Chaparala entitled "MAGNETIC POSITION DETECTION FOR MICRO MACHINED OPTICAL ELEMENTS," Agent's Docket No. ONX-117A, filed 5/8/2001, and which is incorporated herein by reference.

## FIELD OF THE INVENTION

This invention relates to optical communications and more particularly to measuring the position of micro machined optical elements.

## BACKGROUND OF THE INVENTION

MEMS free-space optical switches can be categorized into two major branches: the planar matrix (2-dimensional) approach, and the beam-steering (3-dimensional) approach. The 2D approach typically involves mirrors that move between on and off position, while the 3-D approach typically involves mirrors that tilt over a continuous range of angles to deflect optical signals from one fiber array to another. The 3-D approach relies on accurate control of mirror position to minimize optical loss from the coupling of photons from one fiber to another.

Fiber optic communications systems are subject to faults that interrupt signal traffic. The fault may occur in the optical switch or in some other part of the system. In both switching approaches it is useful for, fault detection purposes, to know whether a given mirror actuating mechanism has failed. One way to determine this is to sense the position of the mirror to determine whether it is in a desired state. If the mirror is not in the desired state, a fault in the mirror mechanism may be determined and signal traffic may be routed around the faulty mirror.

Most of these MEMS optical elements have used some variation of sensing capacitance or piezoresistance as a means of detecting the angular position of the optical element. In the 2D approach, to perform accurate capacitance sensing the signal lines have to be shielded which